High-resolution imaging and computational analysis of haematopoietic cell dynamics in vivo.

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Public Summary:

Scientific Abstract:
Although we know a great deal about the phenotype and function of haematopoietic stem/progenitor cells, a major challenge has been mapping their dynamic behaviour within living systems. Here we describe a strategy to image cells in vivo with high spatial and temporal resolution, and quantify their interactions using a high-throughput computational approach. Using these tools, and a new Msi2 reporter model, we show that haematopoietic stem/progenitor cells display preferential spatial affinity for contacting the vascular niche, and a temporal affinity for making stable associations with these cells. These preferences are markedly diminished as cells mature, suggesting that programs that control differentiation state are key determinants of spatiotemporal behaviour, and thus dictate the signals a cell receives from specific microenvironmental domains. These collectively demonstrate that high-resolution imaging coupled with computational analysis can provide new biological insight, and may in the long term enable creation of a dynamic atlas of cells within their native microenvironment.